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Factsheet

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Maximizing Conception Rate in Dairy Cows

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1. HEAT DETECTION

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Poor reproductive performance is the prime reason why cows are removed from dairy herds. Over 30% of cows culled from dairy herds are disposed of due to poor reproduction. Poor reproductive performance means decreased total milk production and one less calf over the lifetime of the cow. Cows open past 100 days after calving mean lost profits of $2.50 to $3. per cow per day.

Essential parts of a successful reproductive management program for a dairy herd include: (1) Goals for Reproductive Performance; (2) Heat Detection System; (3) Balanced Nutrition Program; and (4) Reproductive Herd Health Program. This Factsheet will deal with the first two: **Goals** and **Heat Detection.**

Goals for Reproductive Performance

Calculation of measures of reproductive performance in your herd is necessary in identifying problem areas. Some of these measures may be readily available from your AI stud or milk recording agency. Some may have to be calculated from your own records.

The values listed in Table 1 are meant to be a guide to reproductive management. A comparison of the average of these measures for a herd as well as the incidence of several problems in the herd will give a good measure of its performance and indicate areas of reproductive inefficiency.

Table 1. Goals for Reproductive Performance

Measure of Performance	Goal	Needs Improvement
Avg interval from calving to 1st heat	40 days	60+
Avg no. days to first service	70 days	90+
Avg no. days open	100 days	120+
Avg calving interval	12.5 mo.	13+
Avg no. services per cow	1.7	2.0+
% cows checked in calf after one service	60%	less than 50
% of herd culled for reproductive reasons	5%	10+
Age at first breeding	15 mo.	17+

Calving interval is the most important overall measure of herd performance. Delayed first breeding has a direct effect on lengthening calving interval.

HEAT DETECTION SYSTEM

Missed heats or failure to detect heat signs **is the number one reason** for long calving intervals. Recent studies indicate that 85-90% of the variation in days open is caused by differences in

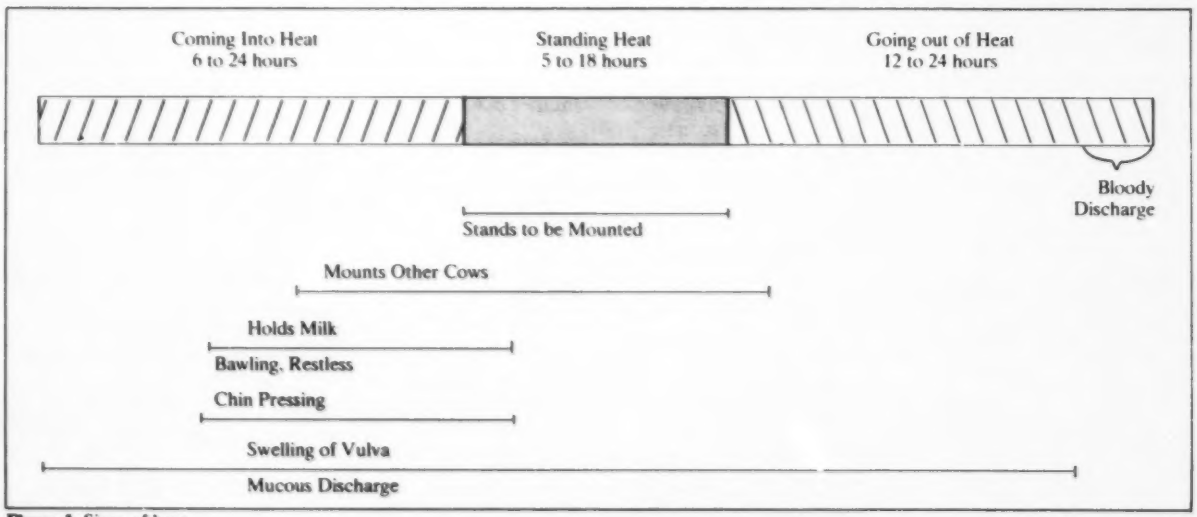

Figure 1. Signs of heat.

Figure 2. Standing to be ridden is the only reliable sign of when to breed a cow. A cow should be bred 12 to 24 hours after the onset of **true standing heat**.

heat detection and only 10-15% is due to differences in conception rate. Fifty to 60% of heats may be missed in problem herds.

Records

Identify all cows and heifers by name, number, ear tag, neck tag or any other means of positive identification with which everyone on the farm is familiar. It may also be useful to tag or mark groups of animals, for example those that are open, and those that are confirmed in calf.

Record each calving date and all reproductive activity. Record systems can include: 21-day calendar, breeding wheel, booklets and file systems as well as computer systems. The heat and breeding dates must be recorded and other symptoms such as signs of blood, mucus discharge, should be recorded as well. Record the first heat after calving as well as all subsequent heats.

Records must be kept up-to-date. They must be easy to use and available to all farm staff, the veterinarian and inseminator. Some dairymen use a heat detection report card whereby a card is filled out for each heat detected. Other symptoms can be recorded on the same card.

An essential part of any record system is a 21-day calendar which can be obtained free from any AI Stud. It should be displayed in a prominent place in the barn. When kept up-to-date, it gives at a glance a prediction of cows that should be checked for heat signs.

Estrous Cycle

To detect heats accurately the dairyman must have a basic understanding of the estrous cycle of the cow. The estrous cycle is a period of time when orderly changes occur in the cow's reproductive organs, hormone levels and sexual behaviour. The most important of these events are:

1. Period leading up to estrus.
2. Acceptance of the bull to allow mating and fertilization (heat, estrus)
3. Release of a mature, fertilizable egg (ovulation).
4. Preparation of the uterus to provide a good environment for implantation and growth of the embryo.

The estrous cycle in a normal, healthy cow is on the average, 21 days, ranging from 17 to 25 days. The cycle of virgin heifers may be 1 or 2 days shorter. Although a few normal cycles occur outside this range, most that do are abnormal and associated with infertility.

The estrous cycle is controlled by hormones. It is important to know how the estrous cycle operates to detect heats properly, identify problem cows, and make wise use of modern drugs such as prostaglandins.

During the estrous cycle, Follicle Stimulating Hormone (FSH) is secreted into the bloodstream by the pituitary gland located at the base of the brain. FSH causes follicles in the ovary to develop and grow in waves at 4, 10 and 16 days in the estrous cycle. A single follicle that develops late in the cycle continues to grow and produce **estrogen** which causes the signs of heat. It will mature and ovulate — releasing a mature egg, just after the period of standing heat (estrus).

The changing levels of estrogen cause the release of **Gonadotropin Releasing Hormone (GnRH)**. GnRH causes the release of **Luteinizing Hormone (LH)** by the pituitary about 2 hours after the start of standing heat. LH causes ovulation to occur 24 to 36 hours after the start of standing heat. The newly released egg passes into the open end of the oviduct and travels toward the uterus. If insemination takes place at the proper time, fertilization will occur partway along the oviduct.

After ovulation, the follicle wall collapses and the corpeus luteum (CL or yellow body) is formed by the cells lining the empty follicular cavity. The CL begins to secrete **progesterone**. **Progesterone** prepares the uterine wall for implantation of the embryo and maintains the early part of pregnancy. If the cow is not pregnant, **prostaglandins** produced by the uterus, breaks down the CL, progesterone production stops and the cow comes back in heat again.

If the cow is pregnant, the CL remains and continues to produce progesterone to maintain the pregnancy. A milk sample taken at day 23 after breeding can be analyzed for progesterone level. This will indicate whether or not the cow is pregnant. The Progesterone Testing Service is operated by the University of Guelph. Sample kits are available from the Ontario AI Studs, as well as the University of Guelph.

Signs of Heat

Standing to be mounted is considered the primary sign of heat. Most cows show increased sexual activity before estrus or actual standing heat. **Secondary heat signs** indicating a cow is near estrus include:

- alert, restless behaviour, bawling
- shortened feeding time
- aggressive behaviour, butting
- swollen, reddened vulva
- mucus discharge
- withholding of milk
- increased urination
- mounting other cows
- chin pressing on other cows
- sniffing, licking of vulva, lip curling

The expression of secondary heat signs shows a great deal of variation among cows. A few or all of these signs will be exhibited 6 to 24 hours before true standing heat. These signs should be noted and the cow watched more closely for standing heat in the next few days (Figure 1).

Standing Heat

The only accurate indication of when to breed a cow is true **standing heat**. This is when a cow will stand to be mounted by another cow.

Figure 3. Cows in tie stalls must be turned loose once daily to show sexual behaviour.

The actual time of standing heat is short. Cows will show **standing heat** for an **average of 10 hours**. Twenty-five percent of all heat periods, however, last less than 8 hours. Many cows come into heat at night. The largest group of cows (70%) actually come into heat between 6 p.m. and 6 a.m.

Work done with continuous observation of cows at the University of Guelph also indicated that cows that come into heat between 1 a.m. and 7 a.m. have short heat periods. Of this group, more than 50% showed standing heat for less than 8 hours.

Mounting activity increases as the number of cows in heat at one time increases. There may be only 11 mounts with one animal in heat compared to up to 50 mounts when 3 animals are in heat. Some natural estrus synchronization may occur within groups of cows. On certain days there might be more than one cow in estrus, and then, blocks of days when there are no cows in estrus.

Heat detection should be carried out **two to three times per day** to accurately detect cows in standing heat. Table 2 shows that 3-times-a-day observation will detect more than 90% of all heats whereas once-a-day observation will only detect 60%. Time spent observing cows should be **at least 20 minutes**. Slowly walk through the group of cows once during the observation period to cause them to move about, and possibly show better heat signs.

Good foot care is critical to cows showing good mounting activity. As well, exercise areas and walkways should have good footing. Grooving or scabbling of smooth concrete surfaces is recommended.

Rules for Good Heat Detection

Tie Stall Barns

- Turn cows loose at least once a day
- Observe for at least 20 minutes
- Observe cows 2 other times of the day
- Do not feed or otherwise distract the cows when you are checking for heats
- Exercise area must have good footing

Free Stall Barns

- Ensure good footing in walkways
- Observe cows 3 times per day for heat
- Have unobstructed view of all cows from viewing area
- Cows will not show good heat signs when feeding or waiting to be milked
- Do not check for heats while there is equipment operating in the area

When to Breed

First heat occurs at 14 to 22 days after calving. Signs of heat are poor at first heat. Heat signs and conception rate improve until the third heat occurs at 50 to 60 days. For best results, plan to breed cows starting at 50 days after calving.

Timing Insemination

The sperm and the egg have limited lifetimes in the female reproductive tract; therefore, timing of insemination is important. The best time to breed is **12 to 24 hours after the onset of standing heat** (Figure 2). When cows are checked for heat 2 or 3 times daily, the onset of standing heat can usually be determined.

Cows first seen in heat in the morning should be bred late in the afternoon. Those first seen in heat in the afternoon or evening should be bred the next morning.

In calling for early or late technician service, the farmer must have observed the cows frequently to determine the start of standing heat. Proper identification of when a cow is actually in standing heat is usually more critical than once or twice daily calls from the technician. In problem herds, 30% of the cows may be bred in the wrong stage of the estrous cycle — when they were not in heat at all.

TABLE 2. **HEAT DETECTION**

NO. OF OBSERVATION PERIODS	% COWS SEEN IN HEAT
Once-a-day observation	60%
Twice-a-day observation	80%
Three-times-a-day observation	90%
Four-times-a-day observation	100%

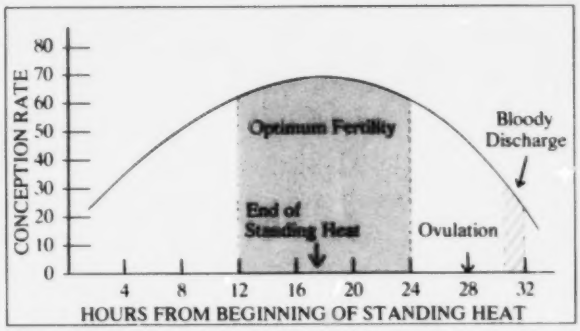

Figure 4. Time to breed cows for best fertility.

Courtesy: Cornell University

Watch cows closely for signs of heat after breeding. A cow showing standing heat the day after breeding probably should be bred again the next day. A bloody discharge will show after standing heat, about 12-30 hours after breeding. Not all cows show an obvious bloody discharge. The presence of a bloody discharge is **no indication** of whether or not the cow is pregnant. It is a good guide whether the timing of the insemination was correct or not.

If a cow has **not** been observed in heat but shows a bloody discharge, she should be marked on the 21-day calendar to watch for heat in 18 days' time.

HEAT DETECTION AIDS

Heat Prediction

Prediction of upcoming heat periods is very important to accurate heat detection. Twenty-one-day calendars, breeding wheels, and computer record systems help predict heat periods when used on a daily basis. The most effective system is one that is used every day by those responsible for heat detection.

Heat mount detection aids or devices are an aid but not a replacement for good reproductive management.

Heat Mount Detectors

Heat mount detectors (Kamar) are pressure-sensitive devices that can be glued on the rump of cows to be checked for heat. When a cow in standing heat is fully mounted by another cow, the pressure causes a color change in the dye capsule in the heat-mount detector. Cows can also be marked with special paint or grease pen. Mounting activity will wear off or smear the marked area.

To be effective these devices require special management:

- position them properly to avoid false positives (see Figure 5)
- remove overhead objects on which cattle might rub
- minimum **once-a-day heat detection** is still required
- cattle must be running loose, have good footing, and adequate space to move about

Heat Detection devices are especially effective with heifers or problem breeders. Heat detection can be 90% with once-a-day observation but very low without regular observation.

Heat Detector Animals

Heifers that have been treated with hormones or a bull with a surgically altered penis can be used to detect cows in heat. A treated heifer or cow is preferred due to ease of handling compared to a bull.